Claims

What is claimed is:

[c1] A method for developing a sub-sea hydrocarbons field, comprising:

liquefying natural gas aboard a vessel using a liquid coolant aboard the vessel to obtain liquefied natural gas;

transporting the liquefied natural gas to an onshore terminal;

re-gasifying the liquefied natural gas; and

obtaining a new batch of liquid coolant using energy recovered from the re-gasifying the liquefied natural gas.

[c2] The method of claim 1, wherein the liquid coolant comprises liquid nitrogen and further comprising:

transporting the new batch of liquid nitrogen offshore aboard the vessel using a plurality of storage tanks.

[c3] The method of claim 1, further comprising:

de-gasifying hydrocarbons obtained from the sub-sea hydrocarbons field to produce oil and gas; and

conveying the produced gas to the vessel and the produced oil to the storage tank on the seabed.

[c4] The method of claim 3, wherein the produced gas is conveyed to the vessel via a riser.

[c5] The method of claim 3, further comprising:

pre-treating the produced gas before liquefying.

[c6] The method of claim 3, further comprising:

storing the oil in a storage tank attached to a seabed.

[c7] The method of claim 1, further comprising:

liquefying a new batch of natural gas using the new batch of liquid nitrogen aboard the vessel.

[c8] The method of claim 1, wherein one of a plurality of storage tanks aboard the vessel storage tanks is empty to receive an initial portion of the liquefied natural gas.

[c9] The method of claim 1, wherein the re-gasifying the liquid natural gas is performed at the onshore terminal.

[c10] The method of claim 1, wherein re-gasifying the liquefied natural gas produces high pressure gas.

[c11] The method of claim 10, further comprising:

sending the high pressure gas to a pipeline.

[c12] The method of claim 1, wherein transporting the liquefied natural gas to the onshore terminal is performed using the vessel.

[c13] A system for developing an oil and gas field, comprising:

a vessel configured to liquefy natural gas to obtain liquefied natural gas using liquid nitrogen aboard the vessel; and

an onshore terminal configured to obtain a new batch of liquid nitrogen using refrigeration recovered from re-gasifying the liquefied natural gas.

[c14] The system of claim 13, further comprising:

a sub-sea separation system configured to de-gasify hydrocarbons to produce oil and gas; and

a natural gas conveyance system configured to use a riser to convey the gas produced from the sub-sea separation system to the vessel; and

convey the oil produced from the sub-sea separation system to a sub0-sea storage tank.

[c15] The system of claim 14, further comprising:

a natural gas pre-treating facility configured to treat the produced gas.

[c16] The system of claim 14, further comprising:

a power and control buoy configured to provide electric power and control functions for the sub-sea separation system.

[c17] An apparatus for developing a sub-sea hydrocarbons field, comprising:

means for liquefying natural gas aboard a vessel using liquid nitrogen aboard the vessel to obtain liquefied natural gas;

means for transporting the liquefied natural gas to an onshore terminal;

means for re-gasifying the liquefied natural gas; and

means for obtaining a new batch of liquid nitrogen using energy recovered from the re-gasifying the liquefied natural gas.